

What is claimed is:

1. A photoresist composition comprising a photoactive component and a polymer that comprises a unit selected from the group of i) a carbonate unit, and ii) a lactone provided by a monomer having a ring oxygen adjacent to a vinyl group.

2. A photoresist composition of claim 1 wherein the carbonate unit and/or lactone are fused to the polymer backbone.

Sub B2
3. A photoresist composition of claim 1 or 2 wherein the polymer comprises photoacid-labile groups.

4. A photoresist composition of any one of claims 1 through 3 wherein polymer further comprises a carbon alicyclic group fused to the polymer backbone.

5. The photoresist composition of claim 4 wherein the carbon alicyclic group is a polymerized norbornene group.

Sub B3
6. The photoresist composition of claim 4 or 5 wherein the carbon alicyclic group comprises a photoacid-labile group.

7. A photoresist composition of any one of claims 1 through 6 wherein the polymer comprises a heteroalicyclic group in addition to the carbonate or lactone.

8. A photoresist composition of claim 7 wherein the additional heteroalicyclic group comprises an oxygen ring member and/or a sulfur ring member.

B4
9. The photoresist composition of claim 7 or 8 wherein the additional heteroalicyclic group has a non-hydrogen ring substituent.

10. The photoresist composition of any one of claims 1 through 9 wherein the polymer comprises a photoacid-labile group that is a substituent of an additional heteroalicyclic polymer group or a carbon alicyclic polymer group.
11. The photoresist composition of any one of claims 1 through 10 wherein the polymer comprises a photoacid-labile moiety of a polymer unit separate a carbonate, lactone or carbon alicyclic unit.
12. The photoresist composition of any one of claims 1 through 11 wherein the polymer comprises a polymerized acrylate that comprises a photoacid-labile moiety.
13. The photoresist composition of any one of claims 1 through 12 wherein the polymer further comprises anhydride units.
14. The photoresist composition of any one of claims 1 through 13 wherein the polymer further comprises maleic anhydride units.
15. The photoresist composition of any one of claims 1 through 14 wherein the polymer is a terpolymer.
16. The photoresist composition of any one of claims 1 through 14 wherein the polymer is a tetrapolymer or a pentapolymer.
17. The photoresist composition of any one of claims 1 through 16 wherein the polymer is substantially free of aromatic groups.
18. The photoresist composition of any one of claims 1 through 17 wherein the photoactive component comprises one or more photoacid generator compounds.

19. The photoresist composition of any one of claims 1 through 18 wherein the photoresist is a chemically-amplified positive-acting resist.

20. A method of forming a positive photoresist relief image, comprising:

- (a) applying a coating layer of a photoresist of any one of claims 1 through 19 on a substrate; and
- (b) exposing and developing the photoresist layer to yield a relief image.

21. The method of claim 20 wherein the photoresist layer is exposed with radiation having a wavelength of less than about 200 nm.

22. The method of claim 20 wherein the photoresist layer is exposed with radiation having a wavelength of about 193 nm.

23. The method of claim 20 wherein the photoresist layer is exposed with radiation having a wavelength of about 157 nm.

24. An article of manufacture comprising a microelectronic wafer substrate or flat panel display substrate having coated thereon a layer of the photoresist composition of any one of claims 1 through 19.

25. A polymer that comprises a unit selected from the group of i) a carbonate unit, and ii) a lactone provided by a monomer having a ring oxygen adjacent to a vinyl group.

26. A polymer of claims 25 wherein the carbonate unit and/or lactone are fused to the polymer backbone.

27. A polymer of claim 25 or 26 wherein the polymer comprises photoacid-labile groups.

28. A polymer of any one of claims 25 through 27 wherein polymer further comprises a carbon alicyclic group fused to the polymer backbone.

29. A polymer of any one of claims 25 through 28 wherein the carbon alicyclic group is a polymerized norbornene group.

30. A polymer of claim 28 or 29 wherein the carbon alicyclic group comprises a photoacid-labile group.⁴

31. A polymer of any one of claims 25 through 30 wherein the polymer comprises a heteroalicyclic group in addition to the carbonate or lactone.

32. A polymer of any one of claims 25 through 31 wherein the additional heteroalicyclic group comprises an oxygen ring member and/or a sulfur ring member.

33. A polymer of any one of claims 25 through 32 wherein the additional heteroalicyclic group has a non-hydrogen ring substituent.

34. A polymer of any one of claims 25 through 33 wherein the polymer comprises a photoacid-labile group that is a substituent of an additional heteroalicyclic polymer group or a carbon alicyclic polymer group.

35. A polymer of any one of claims 25 through 34 wherein the polymer comprises a photoacid-labile moiety of a polymer unit separate a carbonate, lactone or carbon alicyclic unit.

36. A polymer of any one of claims 25 through 35 wherein the polymer comprises a polymerized acrylate that comprises a photoacid-labile moiety.

37. A polymer of any one of claims 25 through 36 wherein the polymer further comprises anhydride units.

38. A polymer of any one of claims 25 through 37 wherein the polymer further comprises maleic anhydride units.

39. A polymer of any one of claims 25 through 38 wherein the polymer is a terpolymer.

40. A polymer of any one of claims 1 through 14 wherein the polymer is a tetrapolymer or a pentapolymer.